

REMARKS/ARGUMENTS

In response to the Office Action mailed January 3, 2008, Applicants amend their application and request reconsideration. No claims are added or cancelled so that claims 1-9 remain pending.

An Information Disclosure Statement is being filed simultaneously with this Response. An indication of consideration of the cited publications in the next communication is respectfully requested. For the Examiner's convenience, where available, cognate U.S. patents are cited for respective foreign language publications that are also mentioned in the Information Disclosure Statement.

Claim 1 is the sole pending independent claim. That claim has been amended to describe in greater detail the invention as disclosed in the patent application in greater detail. Claim 1, as amended, clearly encompasses at least the embodiment of Figures 11, 12A, and 12B of the patent application, described at pages 25-27 of the patent application. Claims 2-9 have been amended to conform to the amendments of claim 1.

Claim 1 describes each of the fins of the heat exchanger as including a plurality of cut-raised portions located at both upstream and downstream sides of each fin with respect to a direction of flow of the second fluid and a heat exchanger tube. The second fluid flows across the fins whereas the first fluid flows within the heat exchanger tubes. These cut-raised portions are symmetrically arranged in the respective fins at the upstream and downstream sides with respect to a center line that connects the centers of the heat exchanging tubes aligned in a column direction that is parallel to the edge of a heat fin on the upstream side. Further, as described in the patent application, the locations of the cut-raised portions are limited within the fins, as described in the amended claim. Cut-raised portions are excluded from an area between the heat exchanger tubes. That area has a width, along the column direction,

meeting the geometrical description that appears in the form of equations at the end of claim 1.

With respect to the examined claims, claims 1 and 2 were rejected as anticipated by Bakay et al. (U.S. Patent 4,830,102, hereinafter Bakay). Claims 1-4, 8, and 9 were rejected as anticipated by or obvious over Satou et al. (JP 10-339594, hereinafter Satou). Although it was stated that claims 5 and 6 were rejected as anticipated by or obvious over Fujinami (JP 11-118380), it is understood that the Examiner intended to include claim 1 in this group of rejected claims. Otherwise, the rejection would be legally indefensible since claims 5 and 6 are dependent claims that depend from claim 1. Finally, claim 7 was rejected as unpatentable over Satou in view of Lu (U.S. Patent 4,821,795). These rejections are all respectfully traversed with respect to the claims now presented.

It is apparent that no pending claim can be anticipated by Bakay because Bakay does not describe the regions between heat exchanger tubes in which no cut-raised portion is present as described in the final paragraphs of amended claim 1. This region is illustrated in nearly all of the figures of the present patent application, for the described embodiments, as the cross-hatched region 5. The importance and function of this cut-raising inhibition zone 5 is described in the patent application from page 13, line 22 through page 17, line 7. This arrangement provides improved heat exchange while avoiding the buildup of frost on the fins. The frost obviously prevents the flow of the second fluid and inhibits the desired heat transfer. Since Bakay is silent on this important feature of the invention, it cannot anticipate any pending claim and, therefore, further comment on Bakay is neither necessary nor provided.

Satou lacks any description of the symmetrical arrangement of cut-raised portions on both upstream and downstream sides of the fins with respect to the heat exchanging tubes. In fact, the pertinent disclosure of Satou is to the contrary as shown by paragraphs [0010] and [0022] of Satou. The former paragraph insists that a flat, i.e., planar, fin must be maintained on the upstream side to achieve effective defrosting and heat exchange. The latter paragraph insists that frost does not form

because of the way moisture is transported by the second fluid. In fact, the inventors have demonstrated that by providing the symmetrical, upstream and downstream arrangement of the cut-raised portions, the heat transfer efficiency is increased substantially, more than ten percent over the Satou structure with only a modest, few percent, increase in pressure drop across the fins. Therefore, no description of nor suggestion for the invention as defined by the amended claims can be found in Satou.

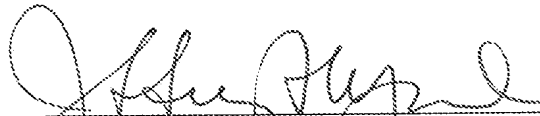
In addition, Satou and the other publications applied fail to recognize the increased simplicity in manufacturing fins having a symmetrical arrangement of cut-raised portion as compared to fins with an asymmetrical arrangement of the cut-raised portions. The symmetrical fins are more easily manufactured because of their symmetry. They are more easily installed on the tubes with reduced risk of deformation due to lack of symmetry as in the Satou fins. In other words, it is not only easier to manufacture the symmetrical fins but easier to manufacture the heat exchange device including those fins with the symmetrically arranged cut-raised portions, as compared to the prior art, such as Satou.

Fujinami, like Satou, fails to describe the symmetrical arrangement of cut-raised portions or equivalent structures. This absence of symmetry is intentional in Fujinami. Fujinami describes placing the heat transfer pipes 3 at a more distant location from the downstream edge of the fins as compared to the upstream edge. According to Fujinami, this placement is made to restrict formation of frost. The cut-raised portions 4 are located between the heat exchange tubes and the upstream edge of the fin. Fujinami, like Satou, not only fails to describe a symmetrical arrangement of the cut-raised portions, as in the invention defined by the claims now pending, Fujinami teaches against such an arrangement as providing detrimental effects. Therefore, Fujinami cannot describe nor suggest the heat exchanger as now claimed.

The rejection of claim 7 as obvious over Satou in view of a secondary reference does not need further comment since the secondary reference was only relied upon with respect to the particular shape of cut-raised portions, and not the overall arrangement described in independent claim 1.

Reconsideration and withdrawal of the rejections of claims 1-9, in view of the claims presented here, as well as allowance of amended claims 1-9 are earnestly solicited.

Respectfully submitted,


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